

Exact Dirac-Bogoliubov-de Gennes dynamics for inhomogeneous quantum liquids

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Abstract

I will discuss a pair of coupled PDEs identified as Bogoliubov-de Gennes equations with Dirac operators and show that they appear naturally in the effective dynamics of inhomogeneous 1D quantum many-body systems. The equations feature an effective local gap coupling right and left movers, leading to scattering, and so far were not solved in general. I show that one can obtain analytical solutions that yield detailed and even explicit information about the dynamics. The physical motivation comes from inhomogeneous Tomonaga-Luttinger liquids, but the equations also arise in superconductor-normal-metal interfaces, polymer chains, and a toy model for coupled FQH edges.